CLAIMS

1. A method for patterning a layer of a low dielectric constant material, comprising:

applying a surface imaging material on a layer of a low dielectric constant material, the surface imaging material having a thickness in the range from about 500 angstroms to about 2,500 angstroms;

defining a pattern in the surface imaging material;

hardening the patterned surface imaging material so that the patterned surface imaging material functions as a hard mask; and

transferring the pattern defined in the surface imaging material to the layer of the low dielectric constant material.

2. The method of claim 1, wherein the low dielectric constant material is selected from the group consisting of doped oxides, organic materials, and nanoporous materials.

3. The method of claim 1, wherein the low dielectric constant material is a low dielectric constant polymeric material having a dielectric constant below about 3.0.

4. The method of claim 1, wherein the hardening of the patterned surface imaging material includes incorporating silicon into the patterned surface imaging material and exposing the patterned surface imaging material to an oxygen containing plasma.

5. The method of claim 1, wherein the surface imaging material has silicon incorporated therein, and the hardening of the patterned surface imaging material includes exposing the patterned surface imaging material to an oxygen containing plasma.

6. A method for forming an integrated circuit, comprising:

forming a layer of a low dielectric constant material on a substrate;

applying a surface imaging material on the layer of the low dielectric constant material, the surface imaging material having a thickness in the range from about 500 angstroms to about 2,500 angstroms;

defining a pattern in the surface imaging material;

hardening the patterned surface imaging material so that the patterned surface imaging material functions as a hard mask; and

transferring the pattern defined in the surface imaging material to the layer of the low dielectric constant material.

7. The method of claim 6, wherein the layer of low dielectric constant material has a thickness in the range from about 3,000 angstroms to about 10,000 angstroms.

8. The method of claim 6, wherein the substrate is a layer of metal coated with a diffusion barrier.

9. The method of claim 8, wherein the pattern transferred to the layer of the low dielectric constant material defines a via therein, and the method further comprises:

forming a layer of photoresist material over the hardened surface imaging material;

defining a trench pattern in the layer of photoresist material; and

transferring the trench pattern into a portion of the layer of the low dielectric constant material.

10. The method of claim 8, wherein the pattern transferred to the layer of the low dielectric constant material defines a trench in an upper portion of the layer of the low dielectric constant material, and the method further comprises:

forming a layer of photoresist material over the hardened surface imaging material and the trench defined in the low dielectric constant material;

defining a via pattern in the layer of photoresist material; and

transferring the via pattern into a lower portion of the layer of the low dielectric constant material.

11. The method of claim 8, wherein the layer of the low dielectric constant material forms a first dielectric layer, the pattern transferred to the first dielectric layer defines a via therein, and the method further comprises:

forming a second dielectric layer over the surface imaging material applied on the first dielectric layer, the second dielectric layer being formed of a low dielectric constant material;

applying the surface imaging material on the second dielectric layer;

defining a trench pattern in the surface imaging material applied on the second dielectric layer;

hardening the patterned surface imaging material applied on the second dielectric layer so that the patterned surface imaging material applied on the second dielectric layer functions as a hardmask; and

transferring the trench pattern defined in the surface imaging material applied on the second dielectric layer to the second dielectric layer in the same process used to transfer the via pattern to the first dielectric layer.

12. The method of claim 6, wherein the low dielectric constant material is selected from the group consisting of doped oxides, organic materials, and nanoporous materials.

13. The method of claim 6, wherein the low dielectric constant material is a low dielectric constant polymeric material having a dielectric constant below about 3.0.

14. The method of claim 6, wherein the hardening of the patterned surface imaging material includes incorporating silicon into the patterned surface imaging material and exposing the patterned surface imaging material to an oxygen containing plasma.

15. The method of claim 6, wherein the surface imaging material has silicon incorporated therein, and the hardening of the patterned surface imaging material includes exposing the patterned surface imaging material to an oxygen containing plasma.

16. A method for patterning a layer of a low dielectric constant polymeric material, comprising:

applying a surface imaging material on a layer of a low dielectric constant polymeric material, the surface imaging material having a thickness in the range from about 500 angstroms to about 2,500 angstroms;

defining a pattern in the surface imaging material;

hardening the patterned surface imaging material so that the patterned surface imaging material functions as a hard mask; and

transferring the pattern defined in the surface imaging material to the layer of the low dielectric constant polymeric material.

17. The method of claim 16, wherein the low dielectric constant polymeric material has a dielectric constant below about 3.0.

18. The method of claim 16, wherein the hardening of the patterned surface imaging material includes incorporating silicon into the patterned surface imaging material and exposing the patterned surface imaging material to an oxygen containing plasma.

19. The method of claim 16, wherein the surface imaging material has silicon incorporated therein, and the hardening of the patterned surface imaging material includes exposing the patterned surface imaging material to an oxygen containing plasma.

20. A method for patterning a layer of a low dielectric constant material, comprising:

applying a surface imaging material on a layer of a low dielectric constant material;

defining a pattern in the surface imaging material;

hardening the patterned surface imaging material so that the patterned surface imaging material functions as a hard mask; and

transferring the pattern defined in the surface imaging material to the layer of the low dielectric constant material.

21. The method of claim 20, wherein the low dielectric constant material is selected from the group consisting of doped oxides, organic materials, and nanoporous materials.

22. The method of claim 20, wherein the low dielectric constant material is a low dielectric constant polymeric material having a dielectric constant below about 3.0.

23. The method of claim 20, wherein the hardening of the patterned surface imaging material includes incorporating silicon into the patterned surface imaging material and exposing the patterned surface imaging material to an oxygen containing plasma.

24. The method of claim 20, wherein the surface imaging material has silicon incorporated therein, and the hardening of the patterned surface imaging material includes exposing the patterned surface imaging material to an oxygen containing plasma.